

Epidemiological Analysis of Work-Related Accidents in Brazil Deliberated by Notification Injury Information System - Sinan

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Abstract

Occupational accidents are considered as one of the health problems of Brazilian workers. The process of underreporting of accidents at work is still very large in Brazil and this, remarkably, makes it difficult to perform the competent services of surveillance of work environments. The objective of this study was to identify and characterize the demand of patients victims of work accidents through public data registered and recognized through the epidemiological bulletin of the Notification Diseases Information System - Sinan. A cross-sectional and retrospective study, descriptive character, classified as bibliographic and statistical research. An analysis of the database of the Ministry of Health was carried out, via SINAN between 2007 and 2016, totaling 118,310 cases of work accidents, it is also emphasized about the legal support of this, through Resolution Number 3 of October 13, 2017, which guarantees the use of transparency and relevant data provided for in article 1 (I) of this standard. It was adopted as a criterion for the inclusion of articles which indicated the involvement by accident of work and, as an exclusion criterion, the one in which in this case had another origin. Results: The highest rates of work accidents occurred in Men (81.70%), from 18 to 29 years (40.1%), in the southeast region (47.50%), 6-7h (17%), on public roads (79.30%), causing leg fracture, including ankle (12.5%), and disability (63%). Final considerations: the study made it possible to detect values of accidents at work that may reflect inefficient notification systems for victims, adopting the assumption that a large number of accidents at work are no longer declared for victims official occupational safety and health inspection agencies. In this sense, it is of fundamental importance to adopt more effective measures to reduce work accidents in the Brazilian social environment, considering the one with the most industrial characteristics in the country. It is also suggested the need to establish appropriate procedures, map risks and promote awareness, especially in male workers, since statistics show that more accidents are at work. We cannot fail to mention technology as a basic tool in conducting daily inspections or audits in the workplaces. Preventive measures such as the use of PPE, develop and determine preventive action plan, monitor the work environment, and control basic training or training to perform an activity. What's more, interventional programs of action at the national level are a way of trying to make the number of work accidents start to progressively decrease through greater and more rigid control over workplaces.

Keywords: Work Accident; Epidemiology; Health; Surveillance; Victims

Introduction

The activity of a worker and his relationship with health is in a worrying way due to the evolution of work development, especially with the recent transformations in society and the most detained concern of public agencies with the work Inco humidity. The term worker's health in Brazil ([1], p. 380), began to be appreciated by the scientific society for maintaining a direct link between their working relationships with the health-disease processes of this individual. Occurrences are recorded daily by occupational accidents, 700,000

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accidents and illnesses annually, due to their connection to work, according to Lhuilier [2], Galdino, Santana and Ferrite [3], Scussiate [4] and ILO [5]. Alarming epidemiological situation, which is an important public health problem.

A work accident is called, according to Vilela, Mendes and Gonçalves ([6], p. 30) that caused through the work exercise, at the service of the work, causing bodily injury or functional disturbance, of temporary or permanent character. Classifying as: typical, path or occupational diseases. Brazil, in 1991 [7], typical accidents occur in a work environment or on the path between housing and the workplace, regardless of the time and the means of locomotion.

It mentions Lorenço and Bertani [8] the Unified Health System - SUS covers in its various forms regarding workers' health and their work relationships intrinsic to events considered harmful in terms of their safety individually. The excerpt below explains what the author wants to show: The incorporation of workers' health by the SUS recognizes, in the environments and work processes, the conditions for the health-aggressive events "of those who work" from the epidemiological perspective. It is not restricted to attending the injured individually, but seeks to quantify the number of people exposed to insecurity and qualify these conditions for further changes ([8], p. 123).

The control of work accidents is assisted by the government, Cordeiro., *et al.* ([9], p. 1575), public policies are necessary for the purpose of applying actions to prevent workers' health. In addition to this scenario, at the present time, there is no information system capable of being able to efficiently cover all possible notifications, in the integration, about accidents at work and thus draw an epidemiological profile fully Coherent.

The retromentioned statement applies through underreporting among workers of the formal market in obtaining statistics referring to the country or of a given region, undersizing the problem, according to Almeida and Branco ([10], p. 196), but studies of this size contribute to the knowledge of current statistics related to work-related accidents in Brazil.

The records of The Communications of Occupational Accidents - CAT, the National Institute of Social Security - INSS and the Death Declarations, Grando and Ascari ([11], p. 7), establishes the essential information of data on occurrences involving the worker.

The Epidemiological Bulletin published by the Department of Health Surveillance, of technical-scientific aptitude, access available in electronic format with monthly and weekly periodicity, and, according to Almeida and Branco ([10], p. 196), passed through the System Notification Diseases Information - SINAN as a considerable tool to promote the dissemination of relevant and qualified information of strategic potential on the guidelines of actions in Public Health in our Brazilian regions.

Based on the findings presented above, the World Health Organization - WHO treats Brazilian transit as a *barbilho de Saúde Pública*, and which, according to WHO [12], provides for the period from 2011 to 2020 as the Decade of Action for Traffic Safety. Deaths and injuries, however, resulting from traffic accidents should be unacceptable, this predictable and preventable event through disputes arising from epidemiological and scientific studies, formulation of safety policies and surveillance actions in workers' health focused on health promotion, collection and analysis of information relevant to health and work conditions, and can be configured in intersectoral relations between sus equipment and the actions developed, aiming at the prevention of work-related injuries.

This study, supported by Resolution No. 3 of October 13, 2017, which has open data plans to be made available according to its relevant potential described in its item I, in addition to free access, located online, on the Internet, corresponding to interaction with society, thus not being responsible for demonstrating itself before the submission process to the Ethics and Research Committee - CEP, via Plataforma Brasil.

In view of the problem and the need to investigate the occurrences by accidents, seeking to answer the following guiding question: what are the epidemiological characteristics of victims of work accidents in Brazil, deliberated by Sinan de 2007 to 2016? To answer this

question, the study aimed to perform an epidemiological analysis of work-related accidents in Brazil deliberated by the information and notification system - SINAN, and as a specific objective to describe the characterization of victims of work accidents assisted through the data provided by the agency referenced above.

However, the development of this study is considered significant, considering the need for the approach related to the epidemiological profile of victims of work accidents in Brazil from Sinan as: demographic definition, number and percentage of accidents in these retrospective years mentioned in the previous paragraph, types of traumas, number and percentage of accidents according to the evolution of the case, from the perspective of a statistical and quantitative evaluation on the data to be achieved and considered as well as aggregation of literary support to other sources of other research at the updated level as a form of contribution in relation to the respective theme understudy.

Materials and Methods

This is a cross-sectional and retrospective analysis, descriptive, categorized as bibliographic and statistical. The research was carried out through public data exposed by the Ministry of Health, conferred in SINAN - the body responsible for processing data on notification injuries throughout the national territory, disseminating knowledge for analysis of the morbidity profile and assisting in the taking of resolutions at the federal, state and municipal level.

The source of information was acquired on the Internet, website of the Ministry of Health, <http://portalsinan.saude.gov.br/>, on which the competent data storage system, and these were collected from 2007 to 2016.

The composition of this sample was performed using the simple random sampling method, all the data reported contained the same probability of being chosen in any evidenced situation.

For the sociodemographic analysis of the population, the variables gender, age and schooling were used. For the construction of the epidemiological profile, the variables regions, type of accident, location, time of the accident, injuries of upper and lower limbs and evolution of the case were used.

As inclusion criteria were used in the study sample, all data deliberated by SINAN, among which had records of the variables of interest to this study. Data sources which did not make the interest of the research were excluded from the research sample in order to compose the objective already specified.

Data collection was performed by researchers over a 10-year period (2007 - 2016), figures provided by SINAN. The data were tabulated and analyzed through the Microsoft Excel 2013 program, where we performed descriptive statistics and presented in the form of tables and graphs.

This study met all the basic and normative precepts of Resolution No. 03 of October 13, 2017 of the Ministry of Planning, Development and Management/Secretariat of Information and Communication Technology/Steering Committee of the National Infrastructure of Open Data, which deals with research on complementary procedures and guidelines for the preparation and publication of Open Data Plan, as provided in Decree No. 9,777/2016 [13]. Thus, the research continues before this support before the law.

Results

A 118,310 epidemiological characterization data were analyzed, 100% involving victims of work accidents, minus the variable on the types of fracture location lesions with a percentage sum of 38.2%, however, the database guaranteed the study a confidence level of 90%

and margin of error of 5%, source of data acquired from the public environment, via the Ministry of Health in order to update information, as well as propose improvements in the number of statistical figures analyzed.

Variable	(No. 118.310)	2007-2016	%
Sex	Male	96.665	81,70
	Female	21.618	18,30
	Ignored	27	0,00
	Total	118.310	100,0
Age Group (years)	< 10	783	0,7
	10 - 17	3.434	2,9
	18 - 29	47.489	40,1
	30 - 39	32.475	27,5
	40 - 49	20.123	17,0
	50 - 59	10.690	9,0
	> 60	3.310	2,8
	Ignored/Blank	6	0,0
Total	118.310	100,0	
Schooling Degree	Illiterate	1.104	0,9
	Elementary School	32.999	27,9
	High School	40.058	33,9
	Higher Education	7.629	6,4
	Does not apply	788	0,7
	Blank	35.732	30,2
Total	118.310	100,0	
Region	North	10.856	9,20
	Northeast	17.642	14,90
	Southeast	56.198	47,50
	On	14.458	12,20
	Central-West	19.156	16,20
Total	118.310	100,0	
Accident Time	6 - 7 a.m.	20.136	17,00
	8 - 9 a.m.	12.154	10,30
	10 - 11 a.m.	10.503	8,90
	12 - 1 p.m.	11.808	10,00
	2 - 3 p.m.	10.589	9,00
	4 - 5 p.m.	13.153	11,10
	6 - 7 p.m.	11.535	9,70
	Blank	14.809	12,50

	Total	118.310	100,0
Accident Site	Public Way	93.797	79,30
	Workplace	14.361	12,10
	Other types	3.673	3,10
	Ignored	6.479	5,50
	Total	118.310	100,0
Upper Members	Fracture at wrist and hand level	6.743	5,7
	Fracture of shoulder and arm	6.302	5,3
	Forearm fracture	5.580	4,7
	Total	18.625	15,7
Lower Limbs	Leg fracture, including ankle	14.750	12,5
	Foot fracture (except ankle)	4.596	3,9
	Femoral fracture	4.337	3,7
	superficial trauma of the leg	2.953	2,5
	Total	26.636	22,5
Case Evolution	Temporary Disability	74.545	63
	Care	14.143	12
	Death from accident	6.128	5,2
	Permanent total disability	413	0,3
	Permanent partial disability	2.917	2,5
	Other causes	1.022	0,8
	Blank	19.142	16,2
	Total	118.310	100,0

Table 1: Sociodemographic characterization of events due to accidents from transport to work, Brazil, 2007 - 2016.

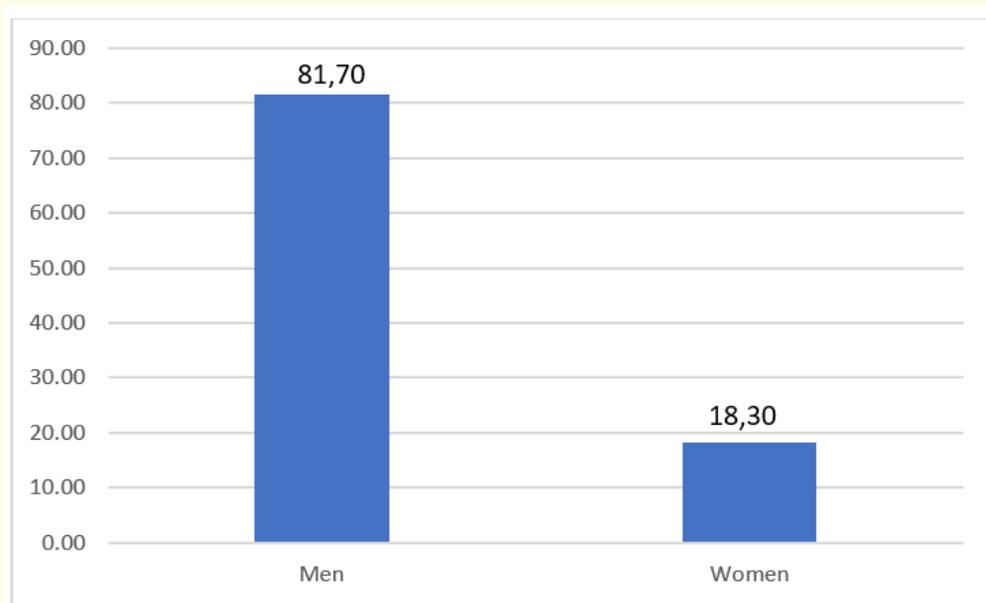
Source: Public data from SINAN (updated August/2017) submitted to adaptation.

From the table, it was verified that sex with the highest incidence of cases from 2007 to 2016 in Brazil was the male sex with a total of 96,665 (81.7%) cases occurred to the detriment of women with only 21.618 (18.3%). Regarding the age group, it was observed that in children under 10 years of age there were only 783 cases (0.7%), with the lowest percentage in this variable, and from 18 to 29 there were the vast majority of incidents with 47,489 (40.1%). In the variable schooling grade 35,732 (30.2%) of the cases were left blank, followed by a medium level with 40,058 (33.9%), and of elementary level 32,999 (27.9%) cases of victims with higher education was only 7,629 (6.4). According to the Brazilian regions: north comprised the lowest number of cases occurred with 10,856 (9.20%), followed from the south with 14,458 (12.20%), northeast 17,642 (14.90%), midwest 19,156 (16.20%), and finally the southeast with the highest rate of (47.50%).

As observed, even though there is no large variation in the number of cases that occur accidents according to the time, we highlight 6 - 7h, 20,136 (17%), the lowest percentage was from 10 - 11 am, 10,503 (8.90%), and in 14,809 (12.50%) were blank. Transport work accidents according to the locality occurred mostly on public roads 93,797 (79.30%). Regarding fractures and traumas of the upper and lower limbs, there were in greater numbers the fracture of the leg, including ankle 14,750 (12.5%), and superficial trauma of the leg in

only 2,953 (2.5%). According to the evolution of the case: temporary disability occurred in 74,545 (63%), cure 14,143 (12%), death from accident 6,128 (5.2%), permanent total disability 413 (0.3%), permanent partial disability 2,917 (2.5%), other causes 1,022 (0.8), blank 19,141 (16.2%).

Discussion



Graph 1: Sociodemographic characterization of events by sex, Brazil, 2007 - 2016.
 Source: Public data from SINAN (updated August/2017) submitted to adaptation.

According to Fiorin [14] the profile of women’s work over the years is composed of advances and permanence. The woman began to insert herself more significantly into the labor market from the 1970s. At that time, working women were almost exclusively young, single and childless.

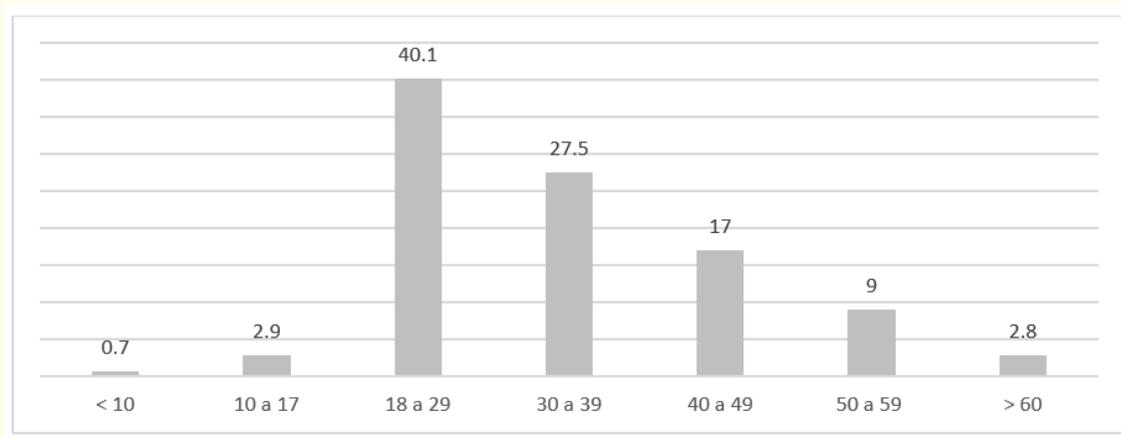
The insertion of married women and children in the world of work outside the home occurred more timidly than for childless women. Women mothers left the home environment to seek work outside the home gradually. Currently, this situation has changed, and it is possible to observe a number of older women, married and mothers performing paid activities outside the home [14].

As the author explains, the relationship of men x women in the labor market is a phenomenon that has a relationship with the process of historical formation of work, mainly because in its genesis were the men who worked the most in activities considered formal, time marked by the great inequality of opportunities in the labour spectrum - and still today persists to a lesser extent.

With the insertion of women in the labour market, interest, in short, was in the absence of force capable of opposing the commandments of employers and, of course, in the small pay of those. Barros [15] explains that the widespread employment of women and minors supplanted the work of men, because the machine reduced physical exertion and made possible the use of half forces, not prepared to

claim. However, considering that men are inserted into the labor market in a higher number, it is natural that on them the largest amount of accidents at work fell.

Graph 2 indicates that the age group with the highest incidence of accidents is the one between 18 and 29 years, presenting 40.1% of the cases. In addition, it is worth mentioning the fact that the age cutout of 30 to 39 years, is victimized with 27.5% of accidents.



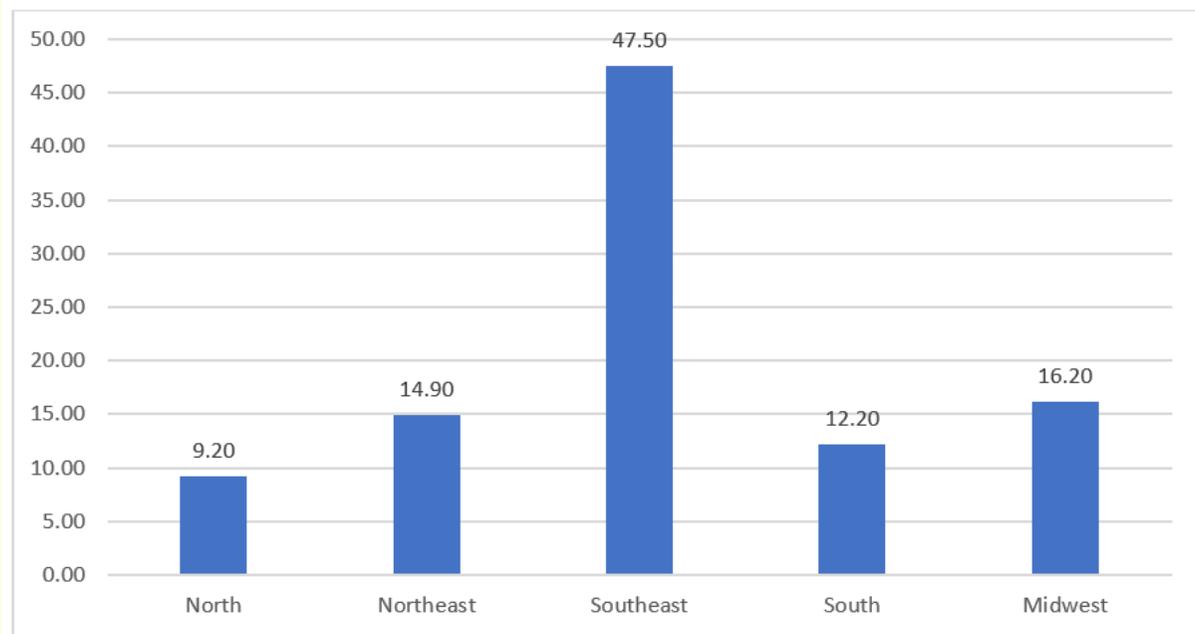
Graph 2: Sociodemographic characterization of events by age group, Brazil, 2007 - 2016.
 Source: Public data from SINAN (updated August/2017) submitted to adaptation.

The age group of when a worker begins to perform his duties that require physical effort and that are developed in unhealthy and/or dangerous places, hence because they are the most harmed by the absence of accidents. Gonçalves [16] explains that among the factors that can contribute to the higher incidence of accidents in younger workers are the professional inexperience and the relative fearlessness of young people when placed in risk situations.

Another given that draws attention is very low incidence of accidents in children under 10 and 17 years, only 2.6% of the cases occurred between 2007 and 2016. Moreover, although since the Industrial Revolution, especially in the 19th century, there has been a record of the use of child labor, in terrible condition, causing serious damage to the physical and psychological development of the person, there are currently policies to ensure protection for the work of the child [17].

In the sense mentioned above, as Novelino [18] teaches, the Constitution of the Republic of 1988 prohibits night work, dangerous or unhealthy to children under eighteen and from any work to children under sixteen, except as an apprentice - is the content of Article⁷ item XXXIII, of the Magna Carta.

Thus, in the face of legislative measures that prohibit the work of children under the age of 16, and with the supervision committed by public agencies, especially the Labor Public Prosecutor’s Office, it is natural that accidents of work with children under 18 years of age are precisely because they are in smaller numbers and functions that do not expose them to vulnerable situations. In fact, the work of minors under 16 years of age, when much, occurs in an obscure and limited way, in the absence of regulation of work activities for the age group in comment, except as an apprentice [18].



Graph 3: Percentage of transport work accidents according to Brazilian Regions, Brazil, 2007 - 2016.

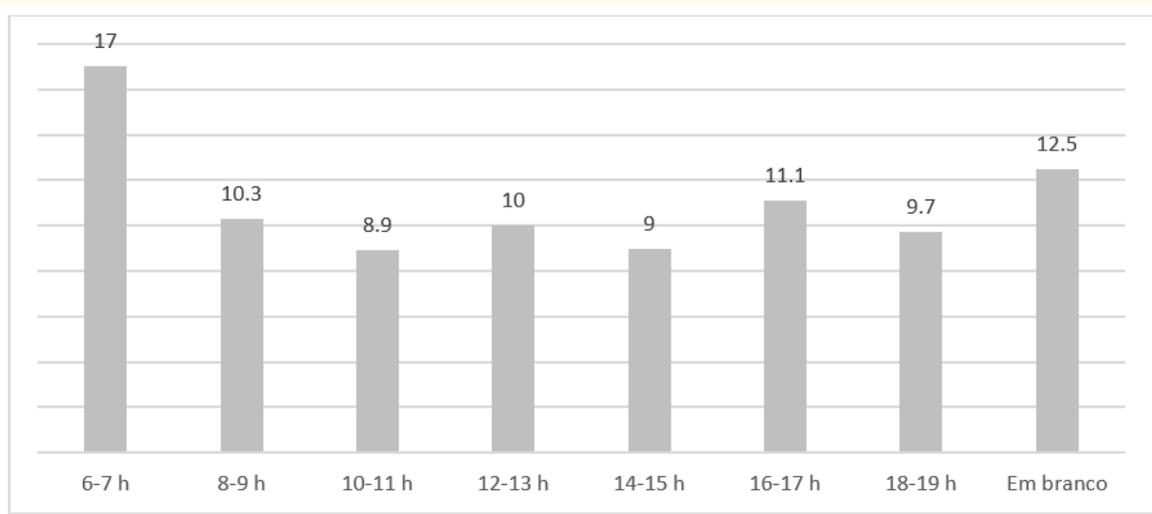
Source: Public data from SINAN (updated August/2017) submitted to adaptation.

Data from graph 3 reflect a set of information provided by Sinan between 2007 and 2016, according to which the southeast region presented the highest accident rate among all regions of the country (47.50%). Due to the sharp number of workers in the regions, the numbers of accidents at work are consequently higher, especially when compared to the northern region - of a more modest population.

Throughout the first half of the 20th century, development focused on productive activities related to the geographical specificities of macroregions produced diverse economic complexes not necessarily integrated with each other. The concentration of urban and productive activities in the coastal spaces (Northeast) and in large metropolitan centers (Southeast and South) was expanded with the industrialization and rural-urban transition of the population [19].

Baeninger [20] explains that over the past fifty years of the 20th century internal migration swelled the population into the national territory, where the strands of industrialisation and agricultural borders have been the axes of the dynamics of spatial distribution of the population at the interstate level, although the first strand held the bulkiest flows. In this sense, the analyses regarding the process of spatial distribution of the population in the 1970s, and even during the 1980s, were based and concerned with pointing out the growing and intense movement of concentration: migration, with the predominance of flow to the Southeast; urbanization process, with the huge transfer of population from the countryside to the city, when about 15.6 million left rural areas during this period.

Graph 4 is the result of the analysis of comparative data of accidents that occur at different times of the day, specifically accidents resulting from transport. Although the accident rates that occurred throughout the day are equated, that is, there is no significant difference between these, it is noteworthy that between 06:00 and 07:00 there is the highest number of records (17%).

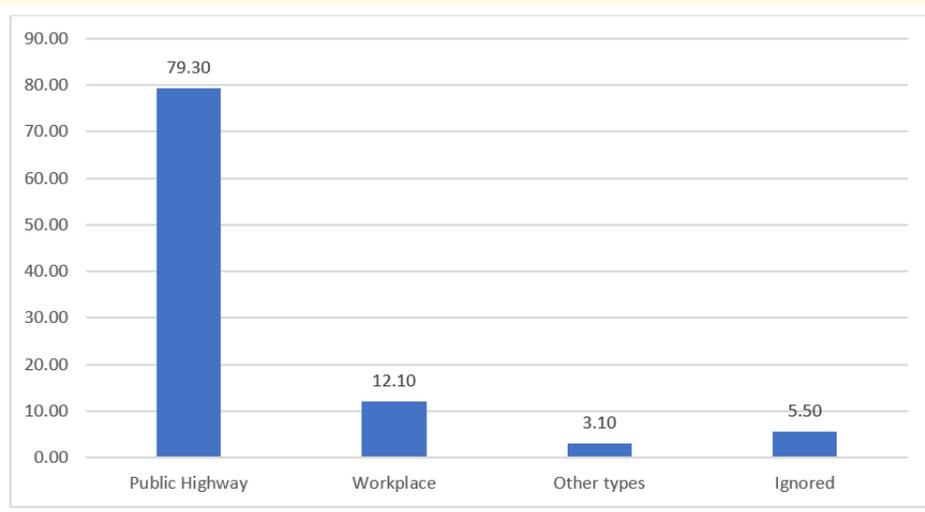


Graph 4: Percentage of transport work accidents according to time, Brazil, 2007 - 2016.
 Source: Public data from SINAN (updated August/2017) submitted to adaptation.

This time is the time of day when people are moving to work or returning home, in the case of people working on duty during the night/early morning, so it is possible that biological factors are linked to accidents that occur in this space of time, and who are able to generate accidents, such as drowsiness.

Muller [21] teaches that sleep is a fundamental biological function in memory consolidation, quality of life, binocular vision, thermo-regulation, energy conservation and restoration and restoration of cerebral energy metabolism. Due to these important functions, sleep disorders can lead to significant changes in the physical, occupational, cognitive and social functioning of the individual, besides substantially compromising the quality of life.

Therefore, statistical data on traffic accidents due to fatigue, drowsiness and over-hours of work have worried researchers and several professionals worldwide [22].

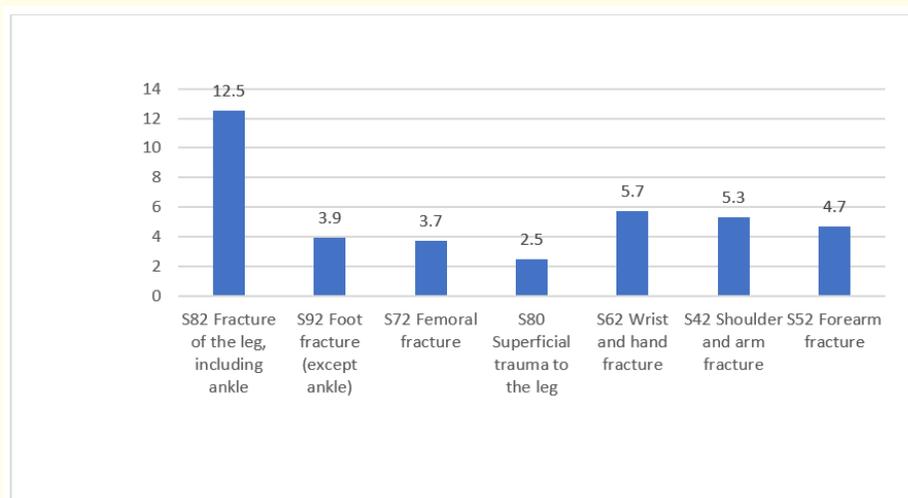


Graph 5: Percentage of transport work accidents according to locality, Brazil, 2007 - 2016.
 Source: Public data from SINAN (updated August/2017) submitted to adaptation.

According to data from graph 5, it is interpreted that the absolute majority of transport work accidents occur on public roads, after all, they are the main means of production flow, as well as the most used way to develop the daily activities of the companies, both for the execution of administrative and commercial referrals.

Road transport is the main means of cargo transport in Brazil. It accounts for about 60% of the cargo transported in the country, using a road network consisting of approximately 1.6 million kilometers and a fleet of 3 million cargo transport vehicles [23].

Graph 6 shows the statistics of cases of fractures and trauma of upper and lower limbs, according to which it is found that there is a prevalence of leg fracture, including ankle (12.5%), fracture at wrist and hand level (5.7%), shoulder fracture and (5.3%), forearm fracture (4.7%), foot fracture, except ankle (3.9%), femoral fracture (3.7%), and superficial leg trauma (2.5%).



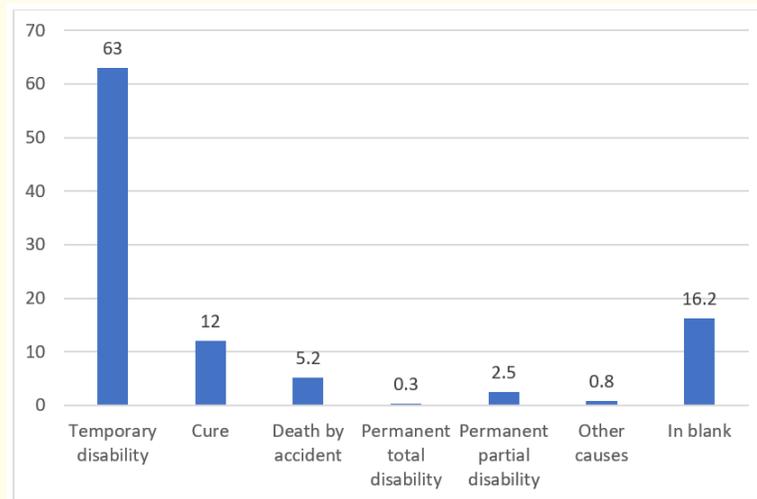
Graph 6: Fractures and trauma of upper and lower limbs, Brazil, 2007 - 2016.
 Source: Public data from SINAN (updated August/2017) submitted to adaptation.

According to Amorim [24] a motorcycle that was a type of vehicle used for leisure, became an instrument of work due to its low cost of acquisition and maintenance and because it constitutes an alternative of rapid displacement in the troubled transit of cities. This fact has contributed to the increase in traffic accident statistics, which constitute work accidents for professional motorcyclists.

Motorcyclists have a greater vulnerability to traffic accidents due to direct exposure during impact with other vehicles or fixed object and are therefore subject to multiple injuries [24].

The body regions most affected in motorcycle accidents are the lower limbs and upper limbs. These regions are unprotected in most motorcyclists, who neglect the use of personal protective equipment for these areas, worrying only about the use of the helmet [24].

Graph 7 portrays the number and percentage of work accidents according to the evolution of the case. It was verified that more than half of the injured workers included in the present study suffered temporary disability (63%), demonstrating that there were lost days of work and severity in accidents. In 2000, a study conducted in the State of Bahia showed that more than 80% of the benefits granted to injured were due to temporary disability ([4], p. 628).



Graph 7: Number and percentage of accidents at work according to the evolution of the case, Brazil, 2007 - 2016.

Source: Public data from SINAN (updated August/2017) submitted to adaptation.

There were cases of cure (12%); death from the accident (5.2%); permanent total disability (0.3%), which is disability for work; permanent partial disability (2.5%), which is the lifetime reduction of work capacity; and other causes (0.8%).

Blank cases (16.2%), stand out with the second highest percentage found. Scussiato [4] explains that monitoring the quality of the information entered in Sinan is very important and should be reinforced with the health professionals responsible for this record, given the occurrence of blank fields in almost all variables analyzed.

Conclusion

Epidemiological research aimed to provide an understanding of the health-related phenomena of populations, serving as an initial guide for the development of actions that modify the patterns associated with the triggering of accidents covering labour workers.

The analysis carried out regarding the demand for work accidents in Brazil and its epidemiological profile reached the expected possibilities, since this approach is in vogue today. Starting from this thought, the research not only conferred numbers but experienced in a real way regarding the huge percentage of work-related accidents.

Accidents at work, we have no doubt that they represent one of the biggest health problems of workers, by the population increase in the labour market, consequently, means of transport and exposure of these to the risk of various types of repercussions for this violent episode, being a world record country in these types of injuries.

Special attention extends to the process of underreporting of cases, it is due to the fact that victims do not seek the SUS for their care, as well as another factor, the potential for severity to be considered mild by this, and, moreover, the absence of understanding when it comes to notification of injuries and their importance in preventive actions of public health.

These accidents are the main causes of death and disability in significant parts of the world, affecting mostly young people - these problems compromise their productivities and, consequently, the country's economy, in this case, the process of actions preventive, despite offering resources that could be effective, the target intended by the fact that, for the most part, is not in the absence of attention, knowledge and even awareness of those involved in this event.

Conflict of Interest

We declare that there is no conflict of interest.

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